Sacramento Valley Groundwater Basin, Dye Creek Subbasin

- Groundwater Basin Number: 5-21.55
- County: Tehama
- Surface Area: 27,730 acres (43 square miles)

Basin Boundaries and Hydrology

The Dye Creek Subbasin comprises the portion of the Sacramento Valley Groundwater Basin bounded on the southwest by the Sacramento River, on the northwest by Antelope Creek, on the east by the Chico Monocline, and on the south by Mill Creek. The Chico Monocline is a geographic boundary with some recharge likely occuring east of the boundary line. The subbasin is contiguous with Antelope and Los Molinos subbasins at depth. Annual precipitation is approximately 17 inches.

Hydrogeologic Information

Water-Bearing Formations

The aquifer system is comprised of continental deposits of Tertiary to late Quaternary age. The Quaternary deposits include Holocene basin deposits and Pleistocene deposits of the Modesto and Riverbank formations and Pleistocene fanglomerate. The Tertiary deposits include Pliocene Tehama and Tuscan formations.

Holocene Basin Deposits. The basin deposits are exposed east of Highway 99, north and south of Dairyville, within the central portion of the subbasin. Basin deposits are the result of sediment-laden floodwaters rising above the natural levees of streams and rivers and spreading across low-lying areas. Thickness of the deposits has not been determined. The deposits generally have low permeability and yield low quantities of water to wells. The quality of groundwater produced from basin deposits is often poor (USBR 1960).

Pleistocene Modesto Formation. The Modesto Formation (deposited between 14,000 and 42,000 years ago) is observed along the western extents of the subbasin. The formation consists of undifferentiated terrace deposits of unconsolidated weathered and unweathered gravel, sand, silt and clay. Thickness of the unit can range from 0- to 150- feet (DWR 2000).

Pleistocene Riverbank Formation. The Riverbank Formation (deposited between 130,000 and 450,000 years ago) is exposed east of the Sacramento River north of Mill Creek. The formation is not a significant water-bearing formation due to its limited depth and areal extents.

Pleistocene Fanglomerate. The fanglomerate is observed along the eastern foothills and within the southern third of the subbasin. The formation is an alluvial fan deposit derived from erosion and deposition of volcanic mudflows of the Tuscan Formation and consists of polylithic volcanic clasts set in weathered tuffaceous matix. The fan deposits are poorly sorted and somewhat indurated to well cemented. Thickness of the fan deposits is up to

150 feet (Ely 1994). The fanglomerate is not sufficiently thick to produce large quantities of groundwater (Olmsted and Davis 1961).

Pliocene Tuscan Formation. The Tuscan Formation is composed of a series of volcanic breccia, tuff, tuff breccia, volcanic sandstone and conglomerate, basalt flows, and tuffaceous silt and clay layers. The formation is described as four separate but lithologically similar units, A through D (with Unit A being the oldest), which in some areas are separated by layers of thin tuff or ash units (Helley and Harwood 1985). Units A, B, and C are found within the subbasin and extend in the subsurface west to the Sacramento River. Surface exposures of Unit D appear along the east side of the subbasin and east of the subbasin boundary. The subsurface extents of Unit D is unknown.

Unit A is the oldest water bearing unit of the formation and is characterized by the presence of metamorphic clasts within interbedded lahars, volcanic conglomerate, volcanic sandstone and siltstone. Unit B is composed of fairly equal distribution of lahars, tuffaceous sandstone, and conglomerate. Unit C consists of massive mudflow or lahar deposits with some interbedded volcanic conglomerate and sandstone. In the subsurface, these low permeability lahars form thick, confining layers for groundwater contained in the more permeable sediments of Unit B. The Tuscan Formation reaches a thickness of 1,500 feet over older sedimentary deposits (DWR 2000). The slope of the formation averages approximately 2.5 degrees, east of the valley, and steepens sharply to 10 to 20 degrees southwestward towards the valley at the Chico Monocline (Olmsted and Davis 1961). The formation flattens beneath valley sediments.

Pliocene Tehama Formation. The Tehama Formation consists of fluvial deposits of predominantly silt and clay with gravel and sand interbeds and occurs in the subsurface along the western boundary of the subbasin (DWR 1987).

Groundwater Level Trends

Review of hydrographs for long-term comparison of spring-spring groundwater levels indicates a decline of 2- to 5-feet associated with the 1976-77 and 1987-94 droughts, followed by a recovery to pre-drought conditions of early 1970's and 1980's. Generally, groundwater level data show a seasonal fluctuation ranging from 2- to 10-feet for normal and dry years. Overall, there does not appear to be any increasing or decreasing trends in the groundwater levels.

Groundwater Storage

The storage capacity of the subbasin was estimated based on estimates of specific yield for the Sacramento Valley as developed in DWR (1978). Estimates of specific yield, determined on a regional basis, were used to obtain a weighted specific yield conforming to the subbasin boundary. The estimated specific yield for the subbasin is 6.0 percent. The estimated storage capacity to a depth of 200 feet is approximately 331,620 acre-feet.

Groundwater Budget (Type B)

Estimates of groundwater extraction for the Dye Creek Subbasin are based on a survey conducted by the California Department of Water Resources in 1994. The survey included landuse and sources of water. Estimates of groundwater extraction for agricultural and municipal/industrial uses are 9,300 and 680 acre-feet respectively. Deep percolation of applied water is estimated to be 3,200 acre-feet.

Groundwater Quality

Characterization. Groundwater in Antelope, Dye Creek, Los Molinos, and Vina subbasins is characterized as calcium-magnesium bicarbonate and magnesium-calcium bicarbonate. Total dissolved solids (TDS) range from 119- to 558-mg/L, averaging 280 mg/L (DWR unpublished data).

Water Quality in Public Supply Wells

Constituent Group[1]	Number of wells sampled[2]	Number of wells with a concentration above an MCL[3]
Inorganics – Primary	2	0
Radiological	2	0
Nitrates	2	0
Pesticides	1	0
VOCs and SVOCs	0	0
Inorganics – Secondary	2	0

[1] A description of each member in the constituent groups and a generalized discussion of the relevance of these groups are included in *California's Groundwater – Bulletin 118* by DWR (2003).
[2] Represents distinct number of wells sampled as required under DHS Title 22 program from 1994 through 2000.
[3] Each well reported with a concentration above an MCL was confirmed with a second detection above an MCL. This information is intended as an indicator of the types of activities that cause contamination in a given basin. It represents the water quality at the sample location. It does not indicate the water quality delivered to the consumer. More detailed drinking water quality information can be obtained from the local water purveyor and its annual Consumer Confidence Report.

Well Characteristics

	Well yields (gal/min)	
Municipal/Irrigation	Range: 200 –3300	Average: 890 (5 Well Completion Reports)
	Total depths (ft)	
Domestic	Range: 19 – 220	Average: 94 (432 Well Completion Reports)
Municipal/Irrigation	Range: 55 –597	Average: 188 (56 Well Completion Reports)

Active Monitoring Data

Agency	Parameter	Number of wells /measurement frequency
DWR	Groundwater levels	8 wells semi-annually
DWR	Miscellaneous water quality	1 well biennially
Department of Health Services	Miscellaneous water quality	3

Basin Management

Groundwater management:	Tehama County adopted a groundwater management ordinance in 1994. Tehama County adopted a countywide AB3030 plan in 1996.
Water agencies	
Public	Tehama County Flood Control and Water Conservation District.
Private	

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Errata

Changes made to the basin description will be noted here.